

## IN THE CLAIMS

Please amend the claims as follows:

Claim 1 (Currently Amended): ~~Method~~ A method for estimating a nitrogen oxide mass stored in a nitrogen oxide catalytic trapping device (1), comprising a catalytic phase, and traversed by the exhaust gases (2) of an internal combustion engine (3) of a motor vehicle (4) comprising an electronic control unit (5), ~~characterized in that~~ wherein:

- the geometry of the catalytic trapping device (1) is split into several (n) perfectly-stirred, successive individual reactors (6, 7); and
- a thermal model allowing calculation of the temperature variation of the catalytic phase of the catalytic trapping device (1) when traversed by the exhaust gases, is combined with an adsorption model allowing calculation at any time of the nitrogen oxide mass stored in the catalytic trapping device (1) as a function of the characteristics of the catalytic trapping device (1), the temperatures from the thermal model for each individual reactor, and the mass flow of exhaust gas from the engine (3).

Claim 2 (Currently Amended): ~~Method~~ The method according to claim 1, ~~characterized in that~~ wherein a correction is carried out of the storage capacity of the nitrogen oxide catalytic trapping device (1) of each individual reactor i of order i (i - 1 to n) being a predetermined function of the temperature of the catalytic phase of the individual reactor i, said storage capacity being a function of corrective parameters comprising the hourly volume velocity of the individual reactor i, the ageing of the catalytic trapping device (1), and its sulphur poisoning.

Claim 3 (Currently Amended): ~~Method~~ The method according to claim 2, ~~characterized in that~~ wherein the mass of nitrogen oxide instantaneously adsorbed ( $dNS_i/dt$ )

by the catalytic trapping device (4) of each individual reactor i (i = 1 to n) is calculated using the following relationship:

$$\frac{dNS\_i}{dt} = NOx\_i * Eff\_i$$

in which:

- NOx\_i : mass flow of nitrogen oxides at the inlet of the individual reactor i, in g/s,  
NOx\_1 calculated;
- Eff\_i : instantaneous storage efficiency in the individual reactor i, a predetermined function of NS\_i/NSC\_i and of T\_i, obtained by looping the calculation of NS\_i/NSC\_i;
- NS\_i : nitrogen oxide mass present in the reactor i, in g;
- NSC\_i : maximum nitrogen oxide mass being able to be stored by the reactor i, in g;
- T\_i : temperature of the catalytic phase at the inlet of the individual reactor i, calculated by the thermal model, in K.

Claim 4 (Currently Amended): ~~Method~~ The method according to the claim 3, ~~characterized in that~~ wherein the nitrogen oxide mass (NS\_i) present in the individual reactor i is calculated using the following relationship:

$$NS\_i = \int_{t_0}^t \left( \frac{dNS\_i}{dt} \right) dt + NS\_i(t_0)$$

in which:

- interval t<sub>0</sub> to t : interval of time between the end (t<sub>0</sub>) of the last of regeneration phase of the catalytic trapping device (4) and the present time (t), in s; and
- NS\_i : nitrogen oxide mass present in the reactor i, in g.

NS<sub>i</sub> (t<sub>0</sub>) : estimated nitrogen oxide mass present in the reactor i at time t<sub>0</sub> corresponding to the end of the last regeneration phase of the catalytic device (1), in g.

Claim 5 (Currently Amended): ~~Method~~ The method according to claim 4, ~~characterized in that~~ wherein the total mass (NS) of nitrogen oxides stored in the entire catalytic trapping device (1) is calculated using the following relationship:

$$NS = \sum_{i=1}^n NS\_I$$

in which:

NS : total mass of nitrogen oxides stored in the entire catalytic trapping device (1), in g; and

NS<sub>i</sub> : nitrogen oxide mass present in the individual reactor i, in g.

Claim 6 (Currently Amended): ~~Method~~ The method according to claim 5, ~~characterized in that~~ wherein the flow of untreated nitrogen oxides leaving the last reactor n is calculated using the following relationship:

$$NOx\_exhaust\ outlet = NOx\_n * (1 - Eff\_n)$$

in which:

NOx<sub>exhaust outlet</sub> : mass flow of untreated nitrogen oxides, at the exhaust outlet after traversing the catalytic trapping device (1), in g/s;

NOx<sub>n</sub> : mass flow of nitrogen oxides at the inlet of the last reactor n, in g/s; and

Eff<sub>n</sub> : instantaneous storage efficiency in the last reactor n.

Claim 7 (Currently Amended): ~~Method~~ The method according to claim 1, ~~characterized in that wherein~~ the geometry of the catalytic trapping device (1) is split into a number of between 1 and 6 perfectly-stirred successive individual reactors ~~comprised between 1 and 6~~.

Claim 8 (Currently Amended): ~~Device~~ A device for estimating a nitrogen oxide mass stored in a nitrogen oxide catalytic trapping device (1), comprising a catalytic phase, and traversed by the exhaust gases (2) of an internal combustion engine (3) of a motor vehicle (4), comprising an electronic control unit (5), ~~characterized in that it comprises~~ wherein the device comprises:

- means for splitting the geometry of the catalytic trapping device into several (n) perfectly-stirred, successive individual reactors; and
- means for estimating the nitrogen oxide mass present in the catalytic trapping device (1) by combining a thermal model allowing calculation of the temperature variation of the catalytic phase of the catalytic trapping device (1) when it is traversed by the exhaust gases, and an adsorption model allowing calculation at any time of the nitrogen oxide mass stored in the catalytic trapping device (1) as a function of the characteristics of the catalytic trapping device (1), the temperatures from the thermal model for each individual reactor, and the mass flow of exhaust gas from the engine (3).

Claim 9 (Currently Amended): ~~Device~~ The device according to claim 8, ~~characterized in that it~~ wherein the device comprises means for carrying out a correction of the storage capacity of the nitrogen oxide catalytic trapping device (1) of each individual reactor i of order i, said correction being a predetermined function of the inlet temperature of

the individual reactor i, and said storage capacity being a function of corrective parameters comprising the hourly volume velocity of the individual reactor i, the ageing of the catalytic trapping device (1), and its sulphur poisoning.

Claim 10 (Currently Amended): ~~Method~~ A method for the periodic regeneration of a nitrogen oxide catalytic trapping device (1)-traversed by the exhaust gases (2)-of an internal combustion engine (3)-of a motor vehicle (4)-comprising an electronic control unit (5), ~~characterized in that~~ wherein the nitrogen oxide mass trapped in the catalytic trapping device (1) is estimated ~~using~~ by the method according to claim 6 ~~claims 6 or 7, or with a device according to claims 8 or 9.~~

Claim 11 (New): A method for the periodic regeneration of a nitrogen oxide catalytic trapping device traversed by the exhaust gases of an internal combustion engine of a motor vehicle comprising an electronic control unit, wherein the nitrogen oxide mass trapped in the catalytic trapping device is estimated with the device according to Claim 8.